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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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08/921,250    08/29/97    INOUE

Y    970813

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EXAMINER

GOUDREAU.G

ART UNIT

PAPER NUMBER

1763

DATE MAILED:

09/06/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No. <b>08-921,250</b>	Applicant(s) <b>Inoue et al</b>
Examiner <b>George Goudreau</b>	Group Art Unit <b>1763</b>

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

## Status

- ☒ Responsive to communication(s) filed on (10-00' to 4-01') (i.e., - papers #12-15)
- ☐ This action is FINAL.
- ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- ☒ Claim(s) 3-14, 16-27, 31-32 is/are pending in the application.
- Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- ☒ Claim(s) 6, 17, 31 is/are allowed.
- ☒ Claim(s) 3-5, 7-14, 16, 18-27, 32 is/are rejected.
- ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- ☐ Claim(s) \_\_\_\_\_ are subject to restriction or election requirement.

## Application Papers

- ☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.
- ☐ The proposed drawing correction, filed on \_\_\_\_\_ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119 (a)-(d)

- ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- ☒ All ☐ Some\* ☐ None of the CERTIFIED copies of the priority documents have been received.
- ☐ received in Application No. (Series Code/Serial Number) \_\_\_\_\_.
- ☐ received in this national stage application from the International Bureau (PCT Rule 1.7.2(a)).

\*Certified copies not received: \_\_\_\_\_

## Attachment(s)

- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s) 12, 13, 15
- ☐ Interview Summary, PTO-413
- ☒ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Other \_\_\_\_\_

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15. This action will not be made final due to the new grounds of rejection.
16. Claims 3-4, 7-14, 16, 18-25, and 32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

-In claims 8, 19, and 32, it is unclear whether applicant is referring to the mole % or weight % C in the film. Applicant should specify in each claim what type of % C applicant is referring to.

17. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

18. Claims 7-8, 16, 18-19, 22, and 24-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Yu et. al. (5,314,843).

Yu et. al. disclose a process for forming a device on a semiconductor wafer which is comprised of the following steps:

-A multitude (42) of alternating layers of conductive, and insulative material are formed, and patterned onto the surface of a wafer.

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- A TEOS SiO<sub>2</sub> layer is conformably formed onto the surface of the wafer.;
- A patterned photo resist mask is formed onto the surface of the TEOS SiO<sub>2</sub> layer.;
- The TEOS SiO<sub>2</sub> layer is selectively ion implanted with P, and B ions to form a BPSG region in the TEOS SiO<sub>2</sub> layer.; and
- The BPSG, and TEOS SiO<sub>2</sub> layers are cmp planarized in a KOH-H<sub>2</sub>O-abrasive silica slurry.

This is discussed specifically in columns 2-8; and discussed in columns 1-12. This is shown specifically in figures 5-7; and shown in general in figures 1-10.

It would have been inherent that the TEOS SiO<sub>2</sub> layer in the process taught above would have at least 1 % C (i.e.-either molar % or weight %) based upon on the following. The TEOS gas used to form the SiO<sub>2</sub> layer is comprised of an organic C based compound which when reacted with other conventionally used compounds to form a SiO<sub>2</sub> layer on a wafer would contain more than 1 mole % C or 1 weight % C. The examiner cites the case law listed below of interest to the applicant in this regard.

In re Swinehart (169 U.S.P.Q. 226 (CCPA )) and In re Best (195 U.S.P.Q. 430 (CCPA )) state that when an examiner has reasonable basis for believing that functional characteristics asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be inherent characteristics of the prior art, the examiner possesses the authority to require an applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied upon.

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19. Claims 7-8, 16, 18-19, 22, and 24-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Shepard (5,616,513).

Shepard discloses a method for fabricating a STI structure on the surface of a wafer which is comprised of the following steps:

- A SiO<sub>2</sub> (210)/Si<sub>3</sub>N<sub>4</sub> (220) stack of layers are formed onto the surface of a wafer (200).;
- The SiO<sub>2</sub>/Si<sub>3</sub>N<sub>4</sub> layers are patterned.;
- The Si wafer has a trench etched into it using the patterned SiO<sub>2</sub>/Si<sub>3</sub>N<sub>4</sub> layers as an etch mask.;
- A TEOS SiO<sub>2</sub> layer (240) is conformably formed onto the surface of the wafer.;
- P ions are implanted into the surface of the TEOS SiO<sub>2</sub> layer.;
- A TEOS SiO<sub>2</sub> layer (240'') is conformably formed onto the surface of the P ion implanted TEOS SiO<sub>2</sub> layer (240').; and
- The TEOS SiO<sub>2</sub> layer (240', and 240'') are cmp planarized down to the surface of the Si<sub>3</sub>N<sub>4</sub> polish stop layer (220) to form an STI structure in the surface of the wafer.

This is discussed specifically in columns 3-5; and discussed in general in columns 1-6.

This is shown in 4 A-4 C; and shown in general in figures 1-5.

It would have been inherent that the TEOS SiO<sub>2</sub> layer in the process taught above would have at least 1 % C (i.e.-either molar % or weight %) based upon on the following. The TEOS gas used to form the SiO<sub>2</sub> layer is comprised of an organic C based compound which when reacted with other conventionally used compounds to form a SiO<sub>2</sub> layer on a wafer would

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contain more than 1 mole % C or 1 weight % C. The examiner cites the case law listed above of interest to the applicant in this regard.

20. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

21. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

22. Claims 3-5, 7-14, 16, 19-27, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brennan et. al. (5,830,773).

Brennan et. al. disclose a process fabricating a device which is comprised of the following steps:

- Mesa patterns are formed into the surface of a Si wafer (10).;
- A TEOS SiO<sub>2</sub> layer (16) is conformably formed onto the surface of the wafer (10).;
- A patterned implant mask (18 a) is formed onto the surface of the SiO<sub>2</sub> layer (16).

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- The surface of the SiO<sub>2</sub> layer (16) is selectively ion implanted with B, P, H, or O ions to form an ion implanted region (26).;
- The implant mask (18 a) is removed from the surface of the wafer.;
- The SiO<sub>2</sub> layer (16) is etch back using a plasma.; and
- The surface of the SiO<sub>2</sub> layer (16) is then cmp planarized.

This is discussed specifically in columns 4-6; and discussed in general in columns 1-8.

This is shown in figures 1-9. Brennan et. al. fail, however, to specifically disclose the following aspects of applicant's claimed invention:

- the specific usage of a cmp slurry containing a fatty acid surfactant, and abrasive particles to cmp planarize the SiO<sub>2</sub> layer in the process taught above;
- the specific formation of a SiO<sub>2</sub> layer with the specific wetting angles which are claimed by the applicant; and
- the specific usage of an SOG layer to form the SiO<sub>2</sub> layer in the process taught above;
- the specific formation of a SiO<sub>2</sub> layer in the process taught above such that it contains at least 1 % C

It would have been inherent that the TEOS SiO<sub>2</sub> layer in the process taught above would have at least 1 % C (i.e.-either molar % or weight %) based upon on the following. The TEOS gas used to form the SiO<sub>2</sub> layer is comprised of an organic C based compound which when reacted with other conventionally used compounds to form a SiO<sub>2</sub> layer on a wafer would

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contain more than 1 mole % C or 1 weight % C. The examiner cites the case law listed above of interest to the applicant in this regard.

It would have been obvious to one skilled in the art to employ a cmp slurry in the process taught above which contains a surfactant such as a fatty acid surfactant, and abrasive particles based upon the following. The usage of surfactants such as fatty acid surfactants in a cmp slurry used to cmp polishing semiconductor based materials is conventional or at least well known in the semiconductor processing arts. (The examiner takes official notice in this regard.) Further, this would have desirably provided a means for improving both the both rate, and the polishing uniformity of the SiO<sub>2</sub> to be cmp planarized by enhancing the ability of the cmp slurry to wet the surface of the SiO<sub>2</sub> layer during the cmp polishing process. Also, the usage of abrasive particles in a cmp slurry used to planarized semiconductor based materials is conventional or at least well known in the semiconductor processing arts. (The examiner takes official notice in this regard.) Further, this would have simply provided a means for desirably improving the rate of cmp polishing of the SiO<sub>2</sub> layer in the process taught above by enhancing the mechanical abrasion of the SiO<sub>2</sub> layer in the process taught above.

It would have been obvious to one skilled in the art to replace the TEOS SiO<sub>2</sub> layer in the process taught above with an SOG type SiO<sub>2</sub> layer based upon the following. The usage of SOG layers to form SiO<sub>2</sub> layers on a wafer is conventional or at least well known in the semiconductor processing arts. (The examiner takes official notice in this regard.) Further, this simply represents

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the usage of an alternative, and at least equivalent means for forming the SiO<sub>2</sub> layer in the process taught above to those means which are specifically taught above.

It would have been obvious to one skilled in the art to form SiO<sub>2</sub> layers in the process taught above such that SiO<sub>2</sub> layers with the specific wetting angles which are claimed by the applicant are formed based upon the following. It would have been desirable to form SiO<sub>2</sub> layers with wetting angles which are less than 30 degrees so that the Si layers on which they are deposited make good surface contact with the SiO<sub>2</sub> layer. The usage of SiO<sub>2</sub> layer with low H<sub>2</sub>O contact angles in the process taught above would ensure that the Si which is coated with the SiO<sub>2</sub> layers would make good contact with the SiO<sub>2</sub> layers.

23. Claims 6, 17, and 31 are allowed.

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner George A. Goudreau whose telephone number is (703) -308-1915. The examiner can normally be reached on Monday through Friday from 9:30 to 6:00.

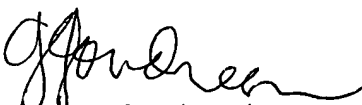
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Examiner Gregory Mills, can be reached on (703) -308-1633. The appropriate fax phone number for the organization where this application or proceeding is assigned is (703) -308-3599.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) -308-0661.

  
George A. Goudreau/gag

Examiner AU 1763